Implementation Guide

hp StorageWorks Rapid Backup Solution with Data Protector 5.1 Direct Backup Engine

First Edition (March 2004)

Part Number: 347922-001, Publication Number: 5982-1419EN

This implementation guide provides information regarding extended copy technology with Direct-Backup and the Rapid Backup Solution for HP OpenView Storage Data Protector v5.1 on HP-UX 11i, using HP StorageWorks XP128 and XP1024 disk arrays.

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About This Guide

This implementation guide provides information regarding extended copy technology with Direct-Backup and the Rapid Backup Solution for HP OpenView Storage Data Protector v5.1 on HP-UX 11i, using HP StorageWorks XP128 and XP1024 disk arrays.

Note: This guide should be used as a *supplement* to the support documentation provided with your solution components.

"About This Guide" topics include:

Overview

This section covers the following topics:

Intended audience

This guide is intended for use by system administrators implementing an EBS configuration who are experienced with the following:

- Tape backup technologies and tape libraries
- SAN environments and backup software
- Fibre Channel technology
- HP-UX administration
- HP OpenView Storage Data Protector v5.1
- HP XP128 and XP1024 LUN configuration
- RAID Manager/Business Copy

Prerequisites

Before you install and configure Data Protector, make sure you have:

- Reviewed the EBS Compatibility Matrix
- Properly installed and configured your EBS hardware per the *HP StorageWorks EBS Design Guide*

Related documentation

In addition to this guide, HP provides corresponding information:

- EBS Compatibility Matrix
- HP blueprints
- *HP StorageWorks EBS Design Guide*
- *HP StorageWorks SAN Design Guide*
- *HP OpenView Storage Data Protector Installation and Licensing Guide*
- *HP OpenView Storage Data Protector Unix Integration Guide*
- *HP RAID Manager XP User Guide*
- *HP StorageWorks Command View XP User Guide for XP128 and 1024*
- *HP StorageWorks Interface Manager and Command View ESL User Guide*

Conventions

Conventions consist of the following:

- Document conventions
- Text symbols

Document conventions

The document conventions included in Table 1 apply in most cases.

Table 1: Document Conventions

Element	Convention
Cross-reference links	Figure 1
Key and field names, menu items, buttons, and dialog box titles	**Bold**
File names, application names, and text emphasis	*Italics*
User input, command and directory names, and system responses (output and messages)	`Monospace font` `COMMAND NAMES` are uppercase monospace font unless they are case sensitive
Variables	*`<monospace, italic font>`*
Web site addresses	Underlined sans serif font text: http://www.hp.com

Text symbols

The following symbols may be found in the text of this guide. They have the following meanings.

WARNING: Text set off in this manner indicates that failure to follow directions in the warning could result in bodily harm or death.

Caution: Text set off in this manner indicates that failure to follow directions could result in damage to equipment or data.

Note: Text set off in this manner presents commentary, sidelights, or interesting points of information.

Getting help

If you still have a question after reading this guide, contact an HP authorized service provider or access our web site: http://www.hp.com.

HP technical support

Telephone numbers for worldwide technical support are listed on the following HP web site: http://www.hp.com/support/. From this web site, select the country of origin.

Note: For continuous quality improvement, calls may be recorded or monitored.

Be sure to have the following information available before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed, specific questions

HP storage web site

The HP web site has the latest information on this product, as well as the latest drivers. Access storage at: http://www.hp.com. From this web site, select the appropriate product or solution.

HP authorized reseller

For the name of your nearest HP authorized reseller:

- In the United States, call 1-800-345-1518
- In Canada, call 1-800-263-5868
- Elsewhere, see the HP web site for locations and telephone numbers: http://www.hp.com.

Introduction

SCSI Extended Copy is known under many different names: XCopy, Third Party Copy (3PC), serverless, E-copy, ServerFree, and Direct Backup. Extended Copy provides the means to copy data from one device to another, bypassing the server. This function offloads precious processing resources and relieves backup server downtime requirements.

Extended Copy solutions are unique in that they tie many software and hardware products together. Choosing a solution based on HP technology provides supportability and known compatibilities.

HP support of XCopy

Solutions using Extended Copy consist of data movers, hosts, disk arrays and backup applications. HP supports XCopy in the Direct Backup Solution through a number of its storage products. This support is made up of SAN interconnects such as Fibre Channel switches, Host Bus Adapters, disk array controllers, and tape controllers. There are a number of devices on the market today with Extended Copy capabilities, most notably Fibre Channel tape drives, servers or workstations and Fibre Channel disk or tape controllers. Because of their flexible platform, technical investment, and cost, tape controllers act as the most approved devices for this technology. HP network storage routers and interface controllers serve as the data mover or copy manager in the EBS Direct-Backup based solutions.

EBS applications such as HP OpenView Storage Data Protector, VERITAS Backup Exec and NetBackup, as well as CA BrightStor ARCserve, all support XCopy data movement, and are all supported by EBS. The XP, EVA, MSA disk arrays are all tested and supported in most XCopy solutions.

Overview of Enterprise Backup Solutions

Extended Copy solutions require storage components such as interface controllers or network storage routers, disk arrays and servers, all on a common Fibre Channel storage area network (SAN). HP StorageWorks Enterprise Backup Solution (EBS) is the traditional HP SAN backup solution, where the servers are in the data path from the source to the target. Setting up and configuring an XCopy backup environment is the same as in most EBS environments.

Properly setting up a Fibre Channel (FC) SAN backup solution can be challenging. Typically components are purchased at different times and arrive separately, or the components are purchased from different vendors. Each piece of hardware arrives with its own documentation for setup and deployment. These challenges may require additional time and money. HP is committed to keeping these challenges to a minimum by providing the *HP StorageWorks Enterprise Backup Solution Design Guide* and this implementation guide.

History

HP engineering teams have developed a comprehensive approach to ensuring that all hardware, firmware, and software components are properly fitted into an Enterprise Backup Solution (EBS). Teams test the supported configurations and develop Best Practices to follow when setting up your own EBS. The teams also test backup solution software and provide best practices to ensure that your EBS runs smoothly.

Purpose

This guide is intended to address many of the integration issues that you may encounter when setting up your EBS and to provide suggestions for the best solution. This guide does not provide specific documentation for installing and configuring your data protection software or tape library hardware. You will be referred to the appropriate documentation when necessary. The guide covers areas where special configuration issues that might not be covered in the vendor documentation will help in your goal of setting up an efficient EBS.

Refer to the *HP StorageWorks Command View XP User Guide for XP128 and 1024* for proper disk array setup and configuration.

Standard extended copy topology

The standard topology for extended copy is one in which a data movement command (extended copy) is sent to a data router through Fibre Channel ❶. The information, sent through buffers from the host explains the Fibre Channel disk volume location and the location of the tape device behind the controller. The router takes the information and moves the data from one Fibre Channel LUN ❷ to another LUN ❸ hosted on its own SCSI bus. See Figure 1 for an illustration of this topology.

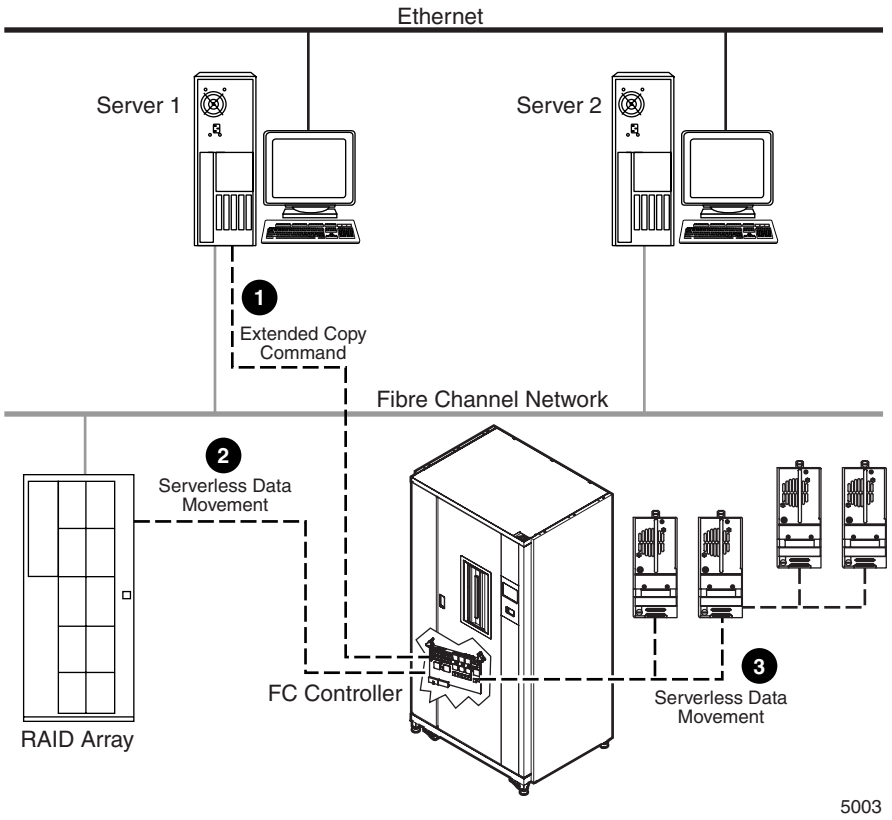

Figure 1: Standard XCopy topology

Planning an XCopy solution

There are several factors to consider when designing an XCopy solution: application server impact, cost, backup and restore performance, array integration, and ease of configuration and use. While all these factors are important, some may not be available in solutions as they are offered today. Because of the complexity of these solutions, they may be easy to use but can be difficult to setup.

While the cost of the solution is always a factor, application server impact and backup performance take center stage in Xcopy solutions. It is easy to see how the application server is removed from the heavy demands of backups in these solutions, whether the demand is handled by the extended copy engine or by an off-host server (as in Zero-Downtime Backup, Business Copy or Enterprise Volume Manager). Backup performance is the most noted benefit of the Extended Copy architecture. Good performance is not achieved using Xcopy to move single-stream backups, however, when used as a tool that can allow one server to initiate multiple streams, performance gains are realized. Taking care to setup an Xcopy backup so that it can be set up to move data in multiple streams requires knowledge in advance when setting up volumes on your Fibre Channel RAID arrays and servers.

Restores are obviously a very important part of the solution's equation but are often overlooked due to the benefits of the backups. While backups can be done very quickly and with little overhead to the application server, restores may be much more intensive and could take longer due to the fact that most applications do not support Xcopy restores.

Finally, array integration can make a substantial difference in how the Xcopy solution behaves. You must consider whether or not to use snapshots vs. clones, or hardware vs. software copies. Typically, a hardware clone (BCV, for example) will work best for 3PC solutions because of immediate availability and it is completely generated by the array. Because of the integration efforts required to control hardware snapshots and clones, most backup applications use a software snapshot engine that is built-in. These built-in options work well for some smaller environments without a lot of change of the primary data during the snapshots active period.

XCopy best practices

Special attention must be focused on presenting the correct targets to the appropriate initiators when using zoning on your SAN. Both the Fibre Channel ports of the disk array and the application server must see and be seen by the tape controllers. For XCopy backups to function properly, the data to be backed up must be located on a SAN device. This ensures that the data mover can communicate with the server, take data to/from the disk array and move it to/from the tape library.

There are three high level steps that must be followed for XCopy backups/restores to take place. They are:

1. Tape media must be mounted and ready for data transfer. Headers are usually written to the tape via local writes from the server as part of the mounting process.
2. The online data must be frozen so that there are no changes to the data structure on the disk and the extent maps for that data while it is being backed up.
3. Data can then be moved from source to target. The backup application issues the XCopy command, which initiates the data movement. The backup server builds the extended copy command with information including what source and targets to use, and what range of blocks is to be moved from source to target.

One of the most important steps in the XCopy backup is to have a frozen image of the data. There are many frozen image providers; they come in both hardware and software forms. The most popular type of frozen image for XCopy solutions is the software snapshot, due to the control needed by the backup application. This functionality is provided through options to the backup software known as image options or open file options. The software snapshot typically comes with the backup application, or sometimes volume managers interact with the backup application to coordinate the production of the frozen image. Creating software snapshots generally requires more CPU and memory overhead from the application server. Hardware snapshots or clones (broken mirrors) require much less effort from the application server, but require a high level of integration between the backup application and the disk array. Hardware snapshots or clones seem to be a good match for most XCopy solutions as all copy operations are performed by the disk array, with little or no impact to the application or backup server.

Some things to note regarding snapshots versus broken mirrors or Business Continuance Volumes (BCVs) are as follows:

- Snapshots are a quick and more affordable method to copy data.
- Snapshots work well in environments where data is not rapidly changing on the entire disk volume.
- As data changes, the snapshot engine must copy over the “frozen” data to its disk, while the primary disk is updated. This could cause backups to be much slower and more complicated.
- Using broken mirrors or BCVs are much more costly; however, they are completely frozen duplicates of data from a point in time.

Restores take on different forms in XCopy solutions. Restores are generally performed using the conventional (traditional) data transfer method. In the traditional method, the application or backup server mounts the tape and pulls data through its buses. From the buses, the data is then moved to the online storage array.

Implementing a Direct Backup Solution

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Note: The configuration rules and recommendations are made based on the solution integration testing conducted by HP. Certain limitations apply and are noted where applicable.

Solutions components

- Logical Volume Manager (LVM)
- VxFS filesystems
- Data Protector v5.1
  - Direct Backup License
  - HP StorageWorks XP agent
- HP StorageWorks ESL9000 Series LTO tape libraries with the HP StorageWorks e2400-160 Fibre Channel Interface Controller and the HP StorageWorks Interface Manager card
  - Command View ESL
  - Direct Backup License
- HP StorageWorks XP disk array
  - HP StorageWorks XP128 or XP1024 disk array
  - Minimum firmware level 21.02.42.00
  - Minimum RAID Manager Library 01.07.02, and RAID Manager 1.10.02
- A6795A FC host bus adapter

Important terms

- **Active Fabric**—A setting on the Fibre Channel Interface Controller that enables controller LUNs for running Direct Backup jobs.
- **Application Server**—The selected application server.
- **Backup Server**—The media agent and offhost that coordinate the direct backup jobs.
- **Business Continuance Volume (BCV)**—An XP internal copy of logical volumes on the disk array.
- **Channel Adapter (CHA)**—A port that serves storage to a SAN, such as the connection on a disk enclosure.
- **Command Device**—A volume on the disk array that accepts Business Copy control operations which are then executed by the disk array.
- **Data Mover**—An extended copy device that reads data blocks from one device on the SAN and writes them to another device. Movers relieve servers of the load incurred by reading data from external disks and writing data to a destination device.
- **Direct Backup**—A term that is used interchangeably with "Serverfree Backup," "Extended Copy," "Third Party Copy," and "3PC."
- **Extended Copy**—A SCSI feature that allows data blocks to be moved between devices on a SAN, bypassing the application server that uses the data.

  A host on the SAN initiates the copy and performs some management and monitoring functions during the copy. These functions include:

  — Identifying the source and target devices for the mover

  — Tailoring the copy command to the mover's capabilities

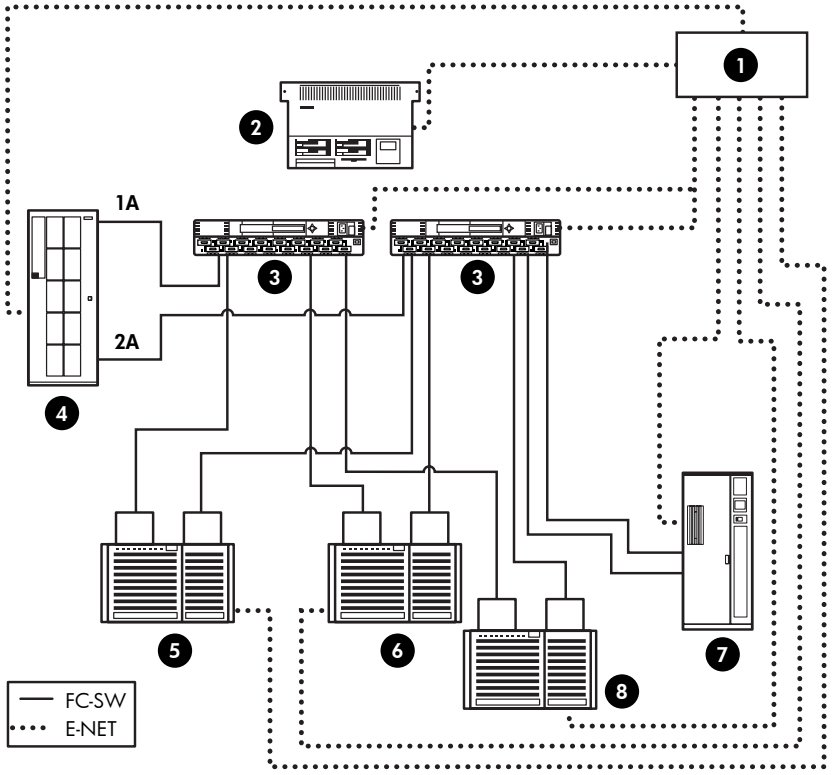
  — Monitoring each segment of the copy for success or failure

  — Including inline data as needed by the backup application
- **P_Vol**—The primary or main volume that contains data to be copied.
- **S_Vol**—The secondary or remote volume (the BCV that receives data from P_Vol).

Test conditions

This document was written with the following test conditions. *Data Protector* briefly locks the filesystem to be backed up through the Logical Volume Manager (LVM). The LVM information and RAID Manager library calls are used to map the LVM volume to the LDEV numbers on the disk array. At this point, Data Protector uses calls in the XP RAID Manager libraries to split the BusinessCopy mirrors. Data Protector then creates a clone LVM diskgroup with the mirrors, which are mounted on the backup server. This allows the filesystem metadata to be sent over the LAN to the media agent in Data Protector. After creating the cloned diskgroup, Data Protector unlocks the LVM filesystem.

The media agent sends SCSI extended copy commands to the Fibre Channel Interface Controller data mover. The media agent includes the filesystem metadata and tape format data inline with the extended copy commands. In turn, the data mover reads the datablocks from the disk array LUNS and sends the datablocks and inline data directly to the tape drive in the library.



❶ Ethernet switch

❷ OV SAM server

❸ FC switch

❹ HP StorageWorks XP128 Disk Array

❺ Data Protector Disk Agent Application Server

❻ Data Protector Cell Manager

❼ HP StorageWorks ESL9000 Series Tape Library with Embedded Fibre Channel Interface Controller and Interface Manager card

❽ Data Protector Media Agent Backup Server

Figure 2: HP XP128/XP1024 Disk Array and Data Protector direct backup

This section assumes that the following tasks have already been completed:

- Data Protector installation
- Hardware connections from the tape library and disk array through switches to hosts

This chapter includes procedures for setting up the following components for Rapid Backup:

- BCV on the disk array
- Backup server
- Application server
- ESL tape library drives
- Fibre Channel Interface Controller

Setting up BCV on the HP StorageWorks XP128/XP1024 disk array

Preparing the hardware

The disk array and the mirror, Business Continuance Volume (BCV), are the sources of the application's primary storage, using Command View XP. The BCV is the location of the data that will be moved to tape when a backup is initiated. The BCV is synchronized with the primary volume. At this point, the BCV and primary data are identical, and the BCV is broken. After the BCV is split for backup, the application server can continue using its primary volumes while the BCV is backed up.

Creating the BCV

For this example, BCVs are created for all primary data volumes. Volumes of identical size to the primary volumes, or P_Vols, are created prior to creating BCVs. Using the **Business Copy** tab, associate the newly created volumes of identical size to the P_Vols using the **Paircreate** menu selection (see Figure 3).

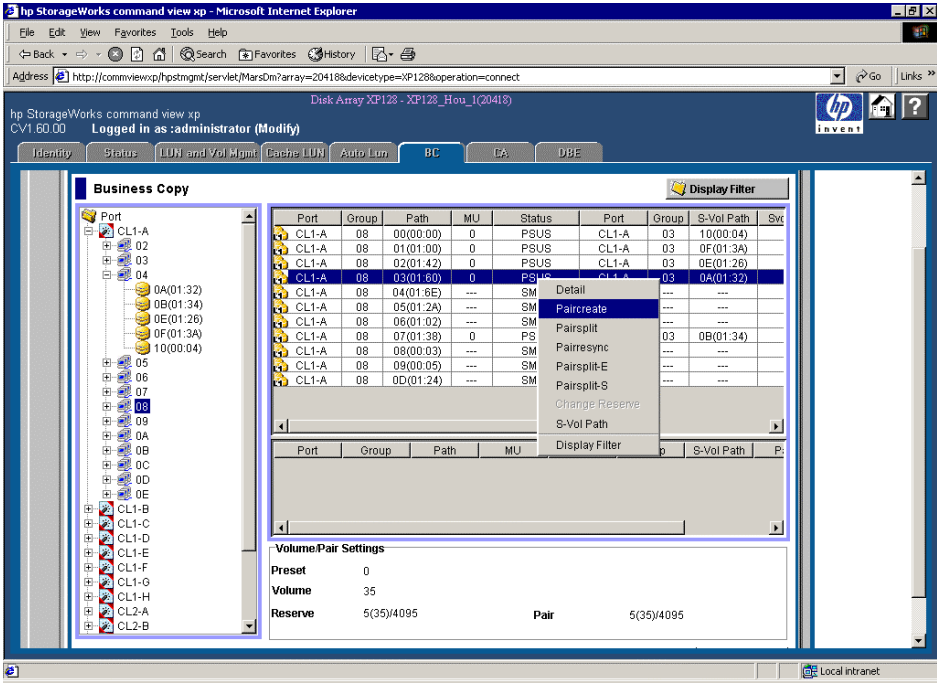


Figure 3: Creating pair groups

The new volumes are called secondary volumes, or S_Vols. The S_Vols serve as your business copies. In the example in Figure 4 the P_Vol path for the table space is **00(00:00)** and the S_Vol path is **10(00:04)**. After the BCV is established, it should remain at a point where it is identical or nearly identical to its primary volume. Keep note of the **LDEV** numbers for the S_Vols; they will be needed when presenting the BCVs to the backup server and Fibre Channel Interface Controller.

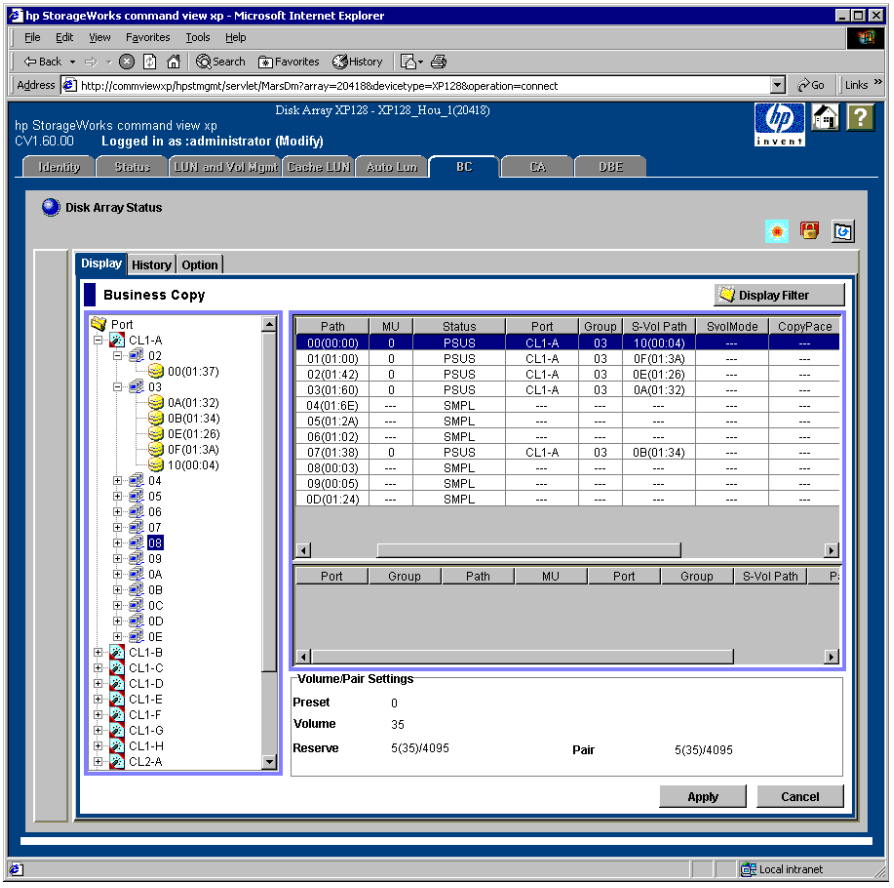


Figure 4: P_Vol and S_Vol path examples

Creating the command device

Creating a command device involves presenting an **LDEV** to the servers requiring its use. The first step is adding the same **LDEV** to the application and backup servers and to the Fibre Channel Interface Controller. In the example in Figure 5, **LDEV 01:23** is added to all three. Right-click **LDEV** as it appears in the **LUN** listing and select **Command Device:OFF ->ON**. If the command device is already active, the selection box will show **Command Device:ON->OFF**.

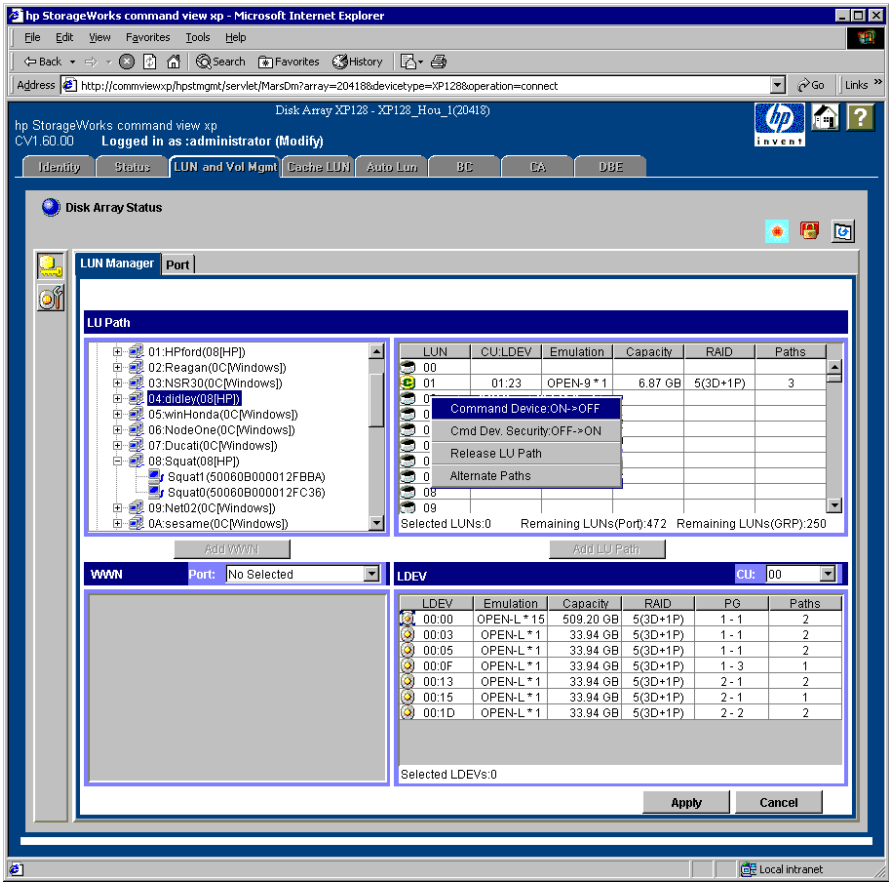


Figure 5: Creating a command device

Presenting volumes

At this point, the following **LDEV**s should be presented to the servers and Fibre Channel Interface Controller:

- Application Server: P_Vols and Command Device
- Backup Server: S_Vols and Command Device
- Fibre Channel Interface Controller: S_Vols and Command Device

Setting up the backup server

Preparing the hardware

The BCVs for the application server data should already be presented to the backup server from the disk array. A disk array command device should already be presented to the application server.

Note: See "Setting up BCV on the HP StorageWorks XP128/XP1024 disk array" on page 22 for procedures on presenting BCVs and a command device to the backup server.

Installing the RAID Manager Library

1. Log in as root.
2. Create a library installation directory of your choice, such as `/opt/raidmngr`.
3. Change directories to the library installation directory that you created.
4. Mount the RAID Manager Library distribution CD-ROM on `/cdrom`.

Note: If the `/cdrom` directory does not exist, create one.

5. Extract the RAID Manager Library software as follows:
   `cpio -idmu < /cdrom/program/RL/HP-UX/RMLIB`
6. Create a soft link in `/usr/lib` to the `RMLIB` directory just extracted as follows:
   `ln -s /opt/raidmngr/RMLIB /usr/lib/RMLIB`

Note: The example in step 6 uses `/opt/raidmngr` as the installation directory.

7. Change directories to `/usr/lib/RMLIB` and run the `rmlibinstall.sh` script.

Installing and configuring the RAID Manager

Note: For detailed instructions, see the *HP StorageWorks RAID Manager XP User Guide*.

1. Log in as root.
2. Create a RAID Manager installation directory of your choice, such as `/opt/HORCM`.
3. Change directories to the RAID Manager installation directory you just created.
4. Mount the RAID Manager distribution CD-ROM on `/cdrom`.

Note: If the `/cdrom` directory does not exist, create one.

5. Extract the RAID Manager software as follows:
   ```
   cat /cdrom/HP-UX/rmxp* | cpio -idum
   ```
6. Create a soft link in `/` to the `HORCM` directory just extracted as follows:
   ```
   ln -s /opt/HORCM /HORCM
   ```

Note: The example in step 6 uses `/opt/HORCM` as the installation directory.

7. Change directories to the installation directory and run the `RMinst.sh` script.
8. Run the `horcminstall.sh` script in the same directory.
9. Configure the RAID Manager service by adding the following line to `/etc/services`:

   ```
   horcm0        11000/udp       # RMINST 0
   ```

Note: The example in step 9 is for RAID Manager instance 0.

10. Modify the */etc/horcm0.conf* configuration file. This file may need to be copied from the sample *horcm.conf* file found in the installation `/etc` directory.
    - *HORCM_MON* section:
      - *ip_address* is the IP address or host name of the application server
      - *service* is the *HORCM* service that was added to `/etc/services` on the application server
      - *poll* is the monitoring interval for paired volumes
      - *istimeout* is the remote server communication timeout
    - *HORCM_CMD* section:
      - *dev_name* is the path to the disk array command device. Multiple paths may be listed if necessary.
    - *HORCM_DEV* section:
      - *dev_group* is an unique, arbitrary group name for a group of disk array volumes to be acted upon with a single RAID Manager command
      - *dev_name* is a unique, arbitrary device name for an disk array volume, such as an Oracle data volume
      - *port, TargetID,* and *LU#* are values for addressing an disk array volume (see Setting up the backup server for determining these values)
      - *MU#* is only used in the case of multiple BCVs, and will not be used in this example
    - *HORCM_INST* section:
      - *dev_group* is the same group name used in the *HORCMDEV* section
      - *ip_address* is the IP address, or host name, of the backup server
      - *service* is the *HORCM* service that was added to `/etc/services` on the backup server

The following is a sample *horcm0.conf* file for the application server.

HORCM_MON

#ip_address	service	poll(10ms)	timeout(10ms)
backupserver	horcm0	1000	3000

HORCM_CMD

#dev_name	dev_name	dev_name
`/dev/rdsk/c15t0d1`		

HORCM_DEV

#dev_group	dev_name	port#	TargetID	LU#	MU#
VG01	datavol1	CL1-A	3	3	
VG01	datavol2	CL1-A	3	4	
VG01	datavol3	CL1-A	4	0	
VG01	datavol4	CL1-A	4	1	
VG01	datavol5	CL1-A	0	1	

HORCM_INST

#dev_group	ip_address	service
VG01	appserver	horcm0

Determining BCV port, target IDs, and LUNs for the HORCM configuration file

Note: The port value should be the port used when configuring the BCVs on the disk array (CL1-A, for example).

1. For the TargetID and LUN value of the disk array volumes, run `ioscan -fnkC disk` on the volumes on the disk array (CL1-A, for example).

- Volumes presented from the disk array will start with the string *OPEN* in the description field. For example, *OPEN-9-CM* would be the command device. BCVs will be other *OPEN-???* devices.
- The device file will contain the TargetID and LUN. For example, the device file `/dev/dsk/c15t1d2` has a TargetID of 1 and the LUN is 2.

2. After creating the initial *HORCM* configuration file, start the *HORC* manager by running `horcmstart.sh` from the installation `usr/bin` directory.

Note: You cannot start the manager until the configuration file has been created.

3. After starting the *HORC* manager, use the *raidscan* utility to show the devices presented from the disk array.

Note: You cannot use *raidscan* without starting the *HORC* manager.

For example, `ls /dev/rdsk/* | raidscan -find` will yield output similar to the following:

DEVICE_FILE	UID	S/F	PORT	TARG	LUN	SERIAL	LDEV	PRODUCT_ID
/dev/rdsk/c15t0d1	0	F	CL1-A	2	0	20418	291	OPEN-9-CM
/dev/rdsk/c15t1d2	0	F	CL1-A	3	3	20418	306	OPEN-9*2
/dev/rdsk/c15t1d3	0	F	CL1-A	3	4	20418	308	OPEN-9*2
/dev/rdsk/c15t1d6	0	F	CL1-A	4	0	20418	294	OPEN-9*8
/dev/rdsk/c15t1d7	0	F	CL1-A	4	1	20418	314	OPEN-9*8
/dev/rdsk/c15t2d0	0	F	CL1-A	0	1	20418	4	OPEN-L*15

4. The *raidscan* utility will show the port (PORT), TargetID (TARG) and LUN of each BCV. If these do not match what you entered in the *HORCM* configuration file, then modify the file to reflect the output of *raidscan*. Always use the port, TargetID and LUN shown by *raidscan.*
5. Add the following *HORCM* environment variables to the root user *.profile* (*sh* and *ksh*) or *.login* (*csh*) file. *HORCC_MRCF* is needed for business copy. *HORCMINST* is the instance number in the `/etc/services` file, which is 0 for this example.

HORCC_MRCF=1
HORCMINST=0
export *HORCC_MRCF HORCMINST*

6. Log off and then log in to the server as root.

Installing Data Protector components

Install the following Data Protector components on the backup server:

- Disk Agent
- Media Agent
- HP StorageWorks XP Agent

Note: Refer to the HP OpenView Storage Data Protector documentation for specific procedures on installing these components.

Configuring Data Protector

1. Set the following environment variables in the */opt/omni/.omnirc* file:

   OB2XCOPYNSR=1

   OB2LUNMODE=0

Note: *OB2XCOPYNSR* is required for the Fibre Channel Interface Controller. *OB2LUNMODE* is required for the XP128/XP1024 disk array.

2. Start the *Data Protector* GUI by running `/opt/omni/bin/xomni`.
3. Run the *Data Protector* automatic device configuration wizard to set up the library and tape devices if this has not already been completed. Start the wizard by right-clicking **Devices** in the **Devices & Media** window (see Figure 6).

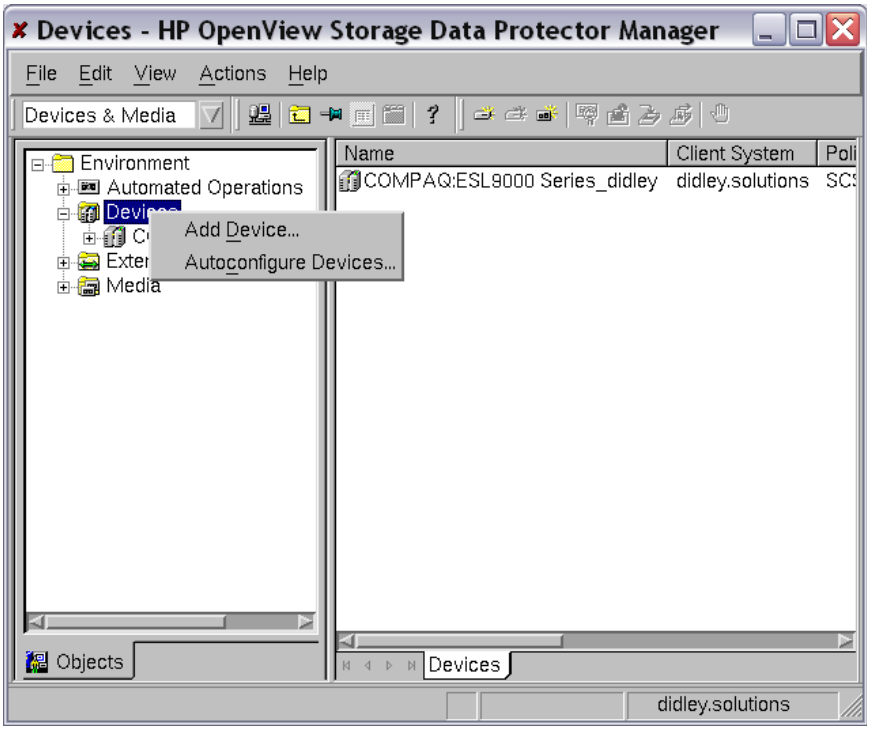


Figure 6: Starting the autoconfiguration wizard

4. Set the tape device parameters in the **Devices & Media** window of the Data Protector GUI (see Figure 7):
   - Select **Devices** in the GUI left panel.
   - Select the correct configured tape library.
   - Select the tape drive to be modified.
   - Select the **Drive** tab in the right panel.

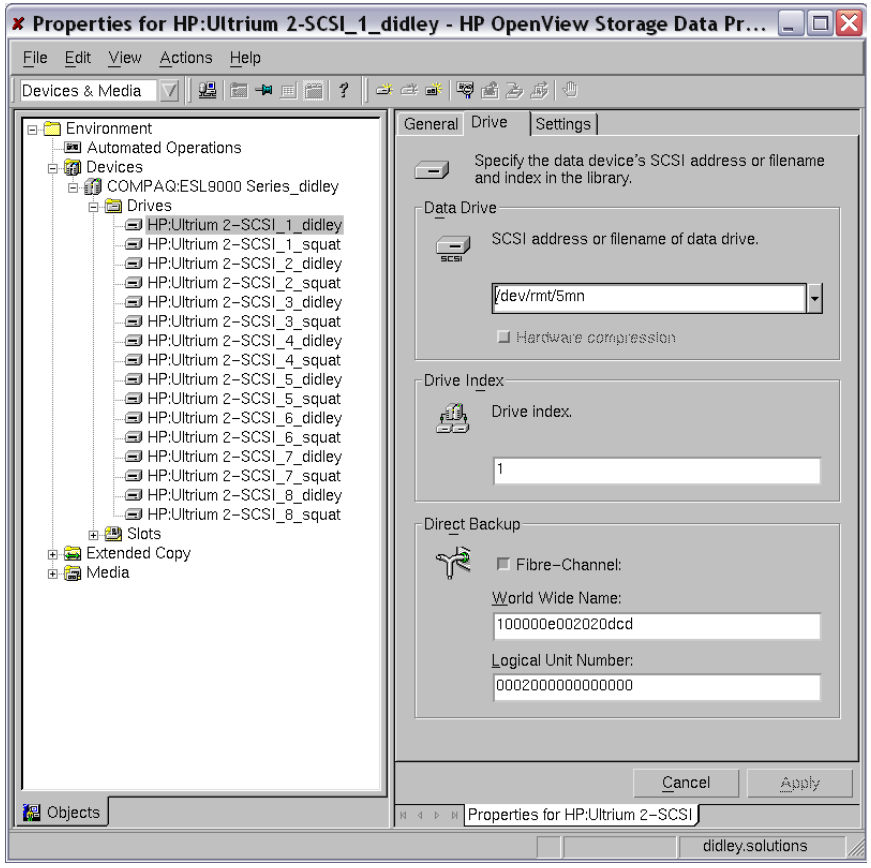


Figure 7: Setting tape device parameters

5. Set the World-Wide-Name and LUN for the tape devices:
   - The World-Wide-Name for a tape device is the 16-digit World-Wide-Port-Name of the Fibre Channel Interface Controller port, through which the tape device is presented.
   - The LUN for a tape device is a 16-digit number in which the second byte is used for the LUN. For example, a tape device with a LUN of 1 would be represented by 0001000000000000 in Data Protector.

   Click **Apply** to save the modifications.
6. Determine the XCopy engines required for direct backup.

   An XCopy engine contains the Data Protector client and device file used to communicate with the Fibre Channel Interface Controller for direct backup (`/dev/rscsi/c20t0d3`).

   a. Run `ioscan -fnkC ctl` on the backup server to list the device files used to communicate with the Fibre Channel Interface Controller ports.

      There must be an XCopy engine for each Fibre Channel Interface Controller port being used with each direct backup tape device.

   b. If a port has multiple tape devices that may be used for direct backup, create an XCopy engine for each tape device. While there may be XCopy engines with the same client and device file, each XCopy engine must have a unique name.

7. Create XCopy engines from the **Devices & Media** window for the Data Protector GUI:
   a. Select **Extended Copy** in the GUI left panel (see Figure 8).
   b. Right-click **Extended Copy** and select **Add XCopy Engine** (see Figure 8).

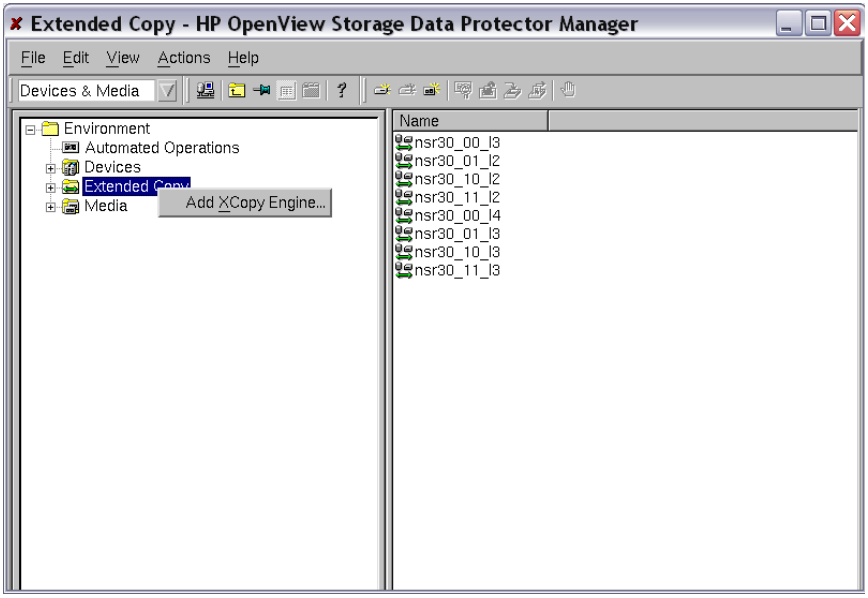


Figure 8: Adding XCopy engines

c. Enter the **Engine Name**, **Client**, and **Device file** (see Figure 9).

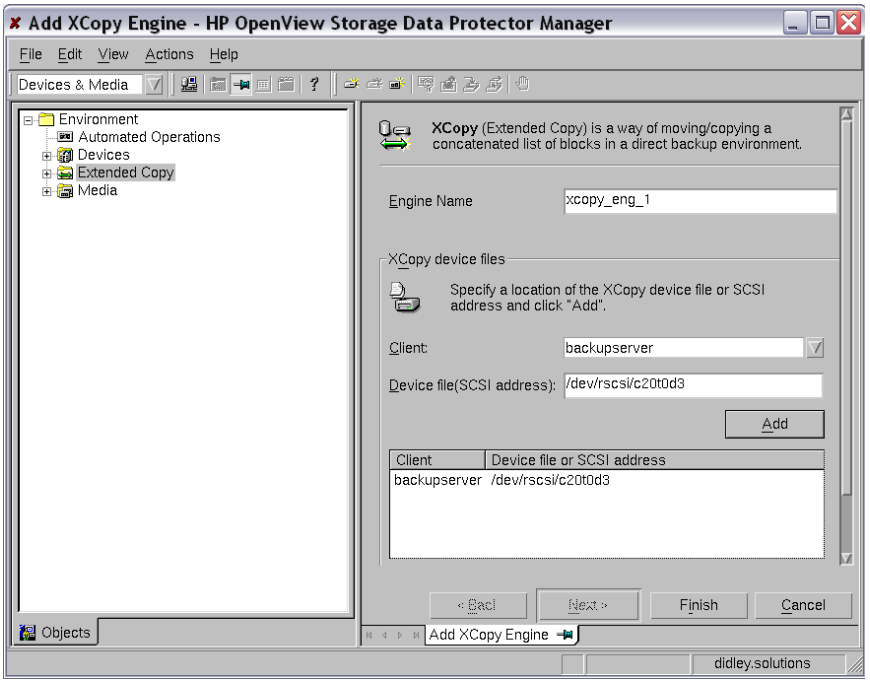


Figure 9: Defining the XCopy engine

d. Click **Finish** to save the configuration.

Setting up the application server

Preparing the hardware

The application data volumes should already be presented to the application server from the disk array. A disk array command device should already be presented to the application server.

Note: See "Setting up BCV on the HP StorageWorks XP128/XP1024 disk array" on page 22 for procedures on presenting data volumes and a command device to the application server.

Installing the RAID Manager Library

1. Log in as root.
2. Create a library installation directory of your choice, such as `/opt/raidmngr`.
3. Change directories to the library installation directory that you created.
4. Mount the RAID Manager Library distribution CD-ROM on `/cdrom`.

Note: If the `/cdrom` directory does not exist, create one.

5. Extract the RAID Manager Library software as f*ollows:*
   ```
   cpio -idmu < /cdrom/program/RL/HP-UX/RMLIB
   ```
6. Create a soft link in `/usr/lib` to the RMLIB directory just extracted as follows:
   ```
   ln -s /opt/raidmngr/RMLIB /usr/lib/RMLIB
   ```

Note: The example in step 6 uses `/opt/raidmngr` as the installation directory.

7. Change directories to `/usr/lib/RMLIB` and run the `rmlibinstall.sh` script.

Installing and configuring the RAID Manager

Note: For detailed instructions, see the *HP StorageWorks RAID Manager XP User Guide*.

1. Log in as root.
2. Create a RAID Manager installation directory of your choice, such as `/opt/HORCM`.
3. Change directories to the RAID Manager installation directory that you just created.
4. Mount the RAID Manager distribution CD-ROM on `/cdrom`.

Note: If the `/cdrom` directory does not exist, create one.

5. Extract the RAID Manager software as follows:
   ```
   cat /cdrom/HP-UX/rmxp* | cpio -idum
   ```
6. Create a soft link in */* to the *HORCM* directory just extracted as follows:
   ```
   ln -s /opt/HORCM /HORCM
   ```

Note: The example in step 6 uses `/opt/HORCM` as the installation directory.

7. Change directories to the installation directory and run the `RMinst.sh` script.
8. Run the `horcminstall.sh` script in the same directory.
9. Configure the RAID Manager service by adding the following line to `/etc/services`:

   ```
   horcm0        11000/udp       # RMINST 0
   ```

Note: The example in step 9 is for RAID Manager instance 0.

10. Modify the */etc/horcm0.conf* configuration file. This file may need to be copied from the sample *horcm.conf* file found in the installation `/etc` directory.
    - *HORCM_MON* section:
      - *ip_address* is the IP address or host name of the application server
      - *service* is the *HORCM* service that was added to `/etc/services` on the application server
      - *poll* is the monitoring interval for paired volumes
      - *istimeout* is the remote server communication timeout
    - *HORCM_CMD* section:
      - *dev_name* is the path to the disk array command device. Multiple paths may be listed if necessary.
    - *HORCM_DEV* section:
      - *dev_group* is an unique, arbitrary group name for a group of disk array volumes to be acted upon with a single RAID Manager command
      - *dev_name* is a unique, arbitrary device name for an disk array volume, such as an Oracle data volume
      - *port, TargetID* and *LU#* are values for addressing an disk array volume (see Setting up the backup server for determining these values)
      - *MU#* is only used in the case of multiple BCVs, and will not be used in this example
    - *HORCM_INST* section:
      - *dev_group* is the same group name used in the *HORCMDEV* section
      - *ip_address* is the IP address, or host name, of the backup server
      - *service* is the *HORCM* service that was added to `/etc/services` on the backup server

The following is a sample *horcm0.conf* file for the application server.

HORCM_MON

#ip_address	service	poll(10ms)	timeout(10ms)
appserver	horcm0	1000	3000

HORCM_CMD

#dev_name	dev_name	dev_name
`/dev/rdsk/c43t1d4`	`/dev/rdsk/c44t1d4`	

HORCM_DEV

#dev_group	dev_name	port#	TargetID	LU#	MU#
VG01	datavol1	CL1-A	1	2	
VG01	datavol2	CL1-A	2	3	
VG01	datavol3	CL1-A	2	2	
VG01	datavol4	CL1-A	1	6	
VG01	datavol5	CL1-A	1	1	

HORCM_INST

#dev_group	ip_address	service
VG01	backupserver	horcm0

11. After starting the *HORC* manager, use the *raidscan* utility to show the devices presented from the disk array.

Note: You cannot use *raidscan* without starting the *HORC* manager.

For example, `ls /dev/rdsk/* | raidscan -find` will yield output similar to the following:

DEVICE_FILE	UID	S/F	PORT	TARG	LUN	SERIAL	LDEV	PRODUCT_ID
/dev/rdsk/c15t0d1	0	F	CL1-A	2	0	20418	291	OPEN-9-CM
/dev/rdsk/c15t1d2	0	F	CL1-A	3	3	20418	306	OPEN-9*2
/dev/rdsk/c15t1d3	0	F	CL1-A	3	4	20418	308	OPEN-9*2
/dev/rdsk/c15t1d6	0	F	CL1-A	4	0	20418	294	OPEN-9*8
/dev/rdsk/c15t1d7	0	F	CL1-A	4	1	20418	314	OPEN-9*8
/dev/rdsk/c15t2d0	0	F	CL1-A	0	1	20418	4	OPEN-L*15

12. The *raidscan* utility will show the port (PORT), TargetID (TARG) and LUN of each BCV. If these do not match what you entered in the *HORCM* configuration file, then modify the file to reflect the output of *raidscan*. Always use the port, TargetID and LUN shown by *raidscan.*
13. Run the *pairdisplay* utility to show the BCV pairs between the backup server and the application server. For example, using `dev_group VG-1` from the above sample *HORCM* configuration file as `pairdisplay -g VG01` will yield output similar to the following:

Group	PairVol(L/R)	(Port#, TID, LU-M) Seq#	LDEV#..P/S, Status, Seq#	P-LDEV# M
VG01	datavol1(L)	(CL1-A, 3, 3-0)20418	306..S-VOL SSUS,----	352 -
VG01	datavol1(R)	(CL1-A, 1, 2-0)20418	352..P-VOL PSUS,20418	306 W
VG01	datavol2(L)	(CL1-A, 3, 4-0)20418	308..S-VOL SSUS,----	312 -
VG01	datavol2(R)	(CL1-A, 2, 3-0)20418	312..P-VOL PSUS,20418	308 W
VG01	datavol3(L)	(CL1-A, 4, 0-0)20418	294..S-VOL SSUS,----	322 W
VG01	datavol3(R)	(CL1-A, 2, 2-0)20418	322..P-VOL PSUS,20418	294 W
VG01	datavol4(L)	(CL1-A, 4, 1-0)20418	314..S-VOL SSUS,----	256 -
VG01	datavol4(R)	(CL1-A, 1, 6-0)20418	256..P-VOL PSUS,20418	314 W
VG01	datavol5(L)	(CL1-A, 0, 1-0)20418	4..S-VOL SSUS,----	0 -
VG01	datavol5(R)	(CL1-A, 1, 1-0)20418	0..P-VOL PSUS,20418	4 W

- The output of *pairdisplay* will show `LDEV` value for the BCV on the backup server and the application server. These values should match the `LDEV` value returned by *raidscan* on each server respectively.

14. Add the following *HORCM* environment variables to the root user *.profile* or *.login* file. *HORCC_MRCF* is needed for business copy, and *HORCMINST* is the instance number in the `/etc/services` file, which is 0 for this example.

    HORCC_MRC =1
    HORCMINS =0
    export *HORCC_MRCF HORCMINST*

15. Log off and then log in to the server as root.

Installing Data Protector components

Install the following Data Protector components on the backup server:

- Disk Agent
- HP StorageWorks XP Agent

Note: Refer to the HP OpenView Storage Data Protector documentation for specific procedures on installing these components.

Configuring a Data Protector backup specification

Configure a Data Protector Direct Backup Client Backup specification for each data volume. The following steps should be repeated for each volume.

1. Start the Data Protector GUI by running `/opt/omni/bin/xomni`.
2. Create the backup specification in the **Backup** window of the Data Protector GUI:
   - Select **Backup Specifications** in the GUI left panel.
   - Right-click **Filesystem** in the GUI left panel under **Backup Specifications** and select **Add Backup** (see Figure 10).

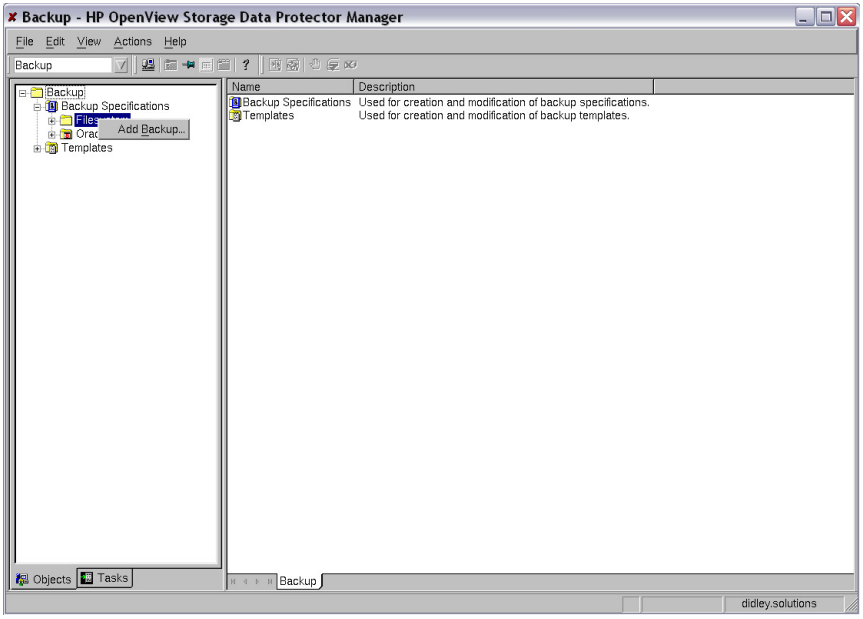


Figure 10: Adding a backup specification

- Select the Blank Filesystem Backup template (see Figure 11).
- Choose **Direct Backup** as the **Backup type** (see Figure 11).
- Choose **HP StorageWorks XP** as the **Sub type** and click **OK** (see Figure 11).

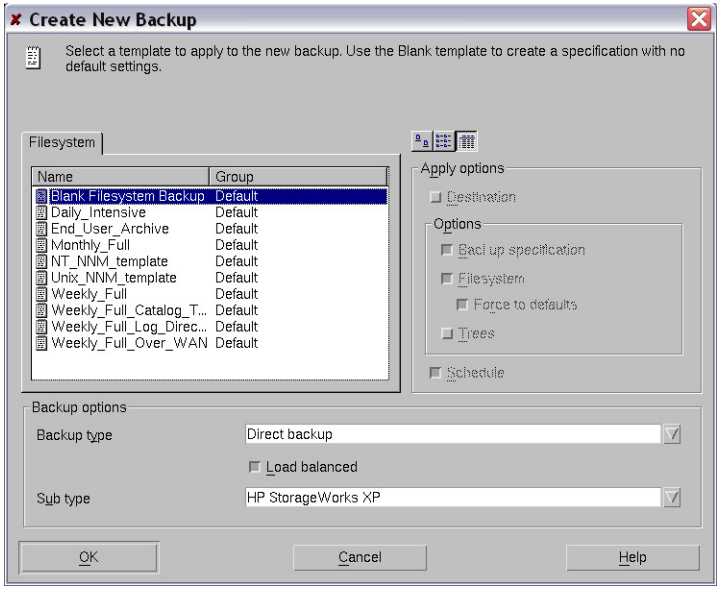


Figure 11: Selecting a backup template and backup options

- Select the application system and backup system, and click **Next**.
  - Data volumes reside on the application system.
  - BC volumes will be mounted for backup on the backup system.

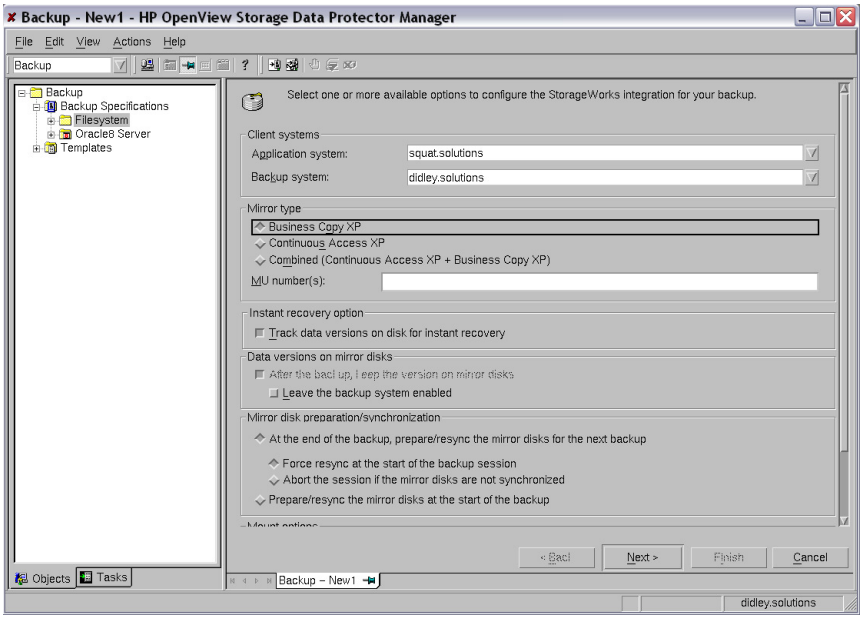


Figure 12: Selecting the application system and backup system

- Click **Add/Remove** in the **Select Application Specific Data** window, enter the raw device file of the volume to back up, then click **Next**.

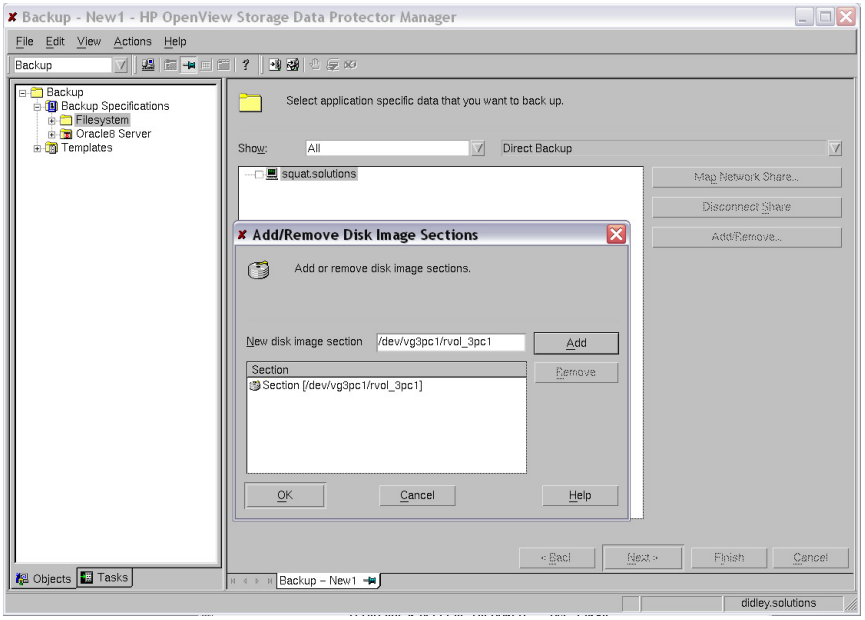


Figure 13: Entering the raw device file of the volume to back up

- Select the tape drive to be used for backup. Be sure to select a drive that resides on the backup server, and not the application server (see Figure 14).

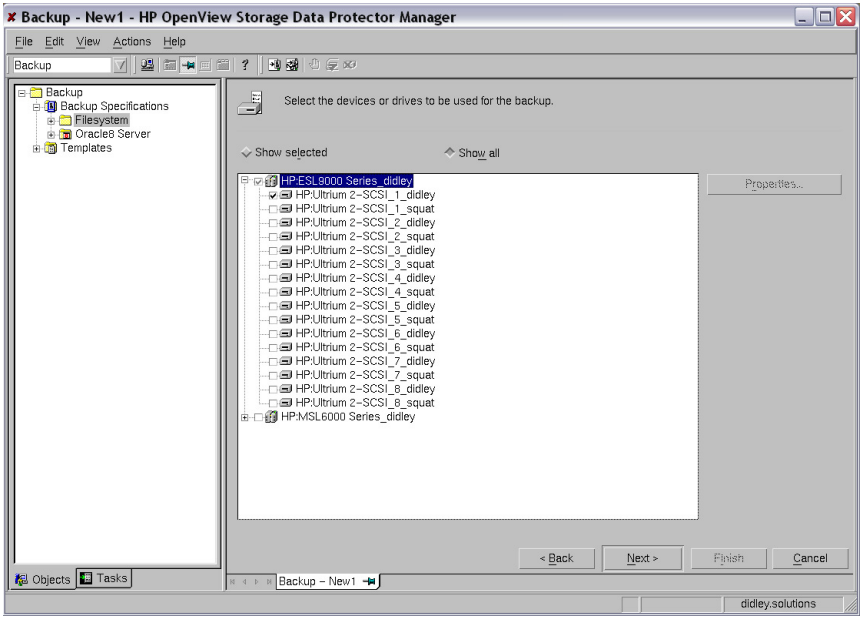


Figure 14: Selecting a tape drive for the backup

- While still in the device destination window, highlight the tape drive and click **Properties** (see Figure 15).
- Select the appropriate **Media pool** and **XCopy engine**, then click **OK** (see Figure 15).

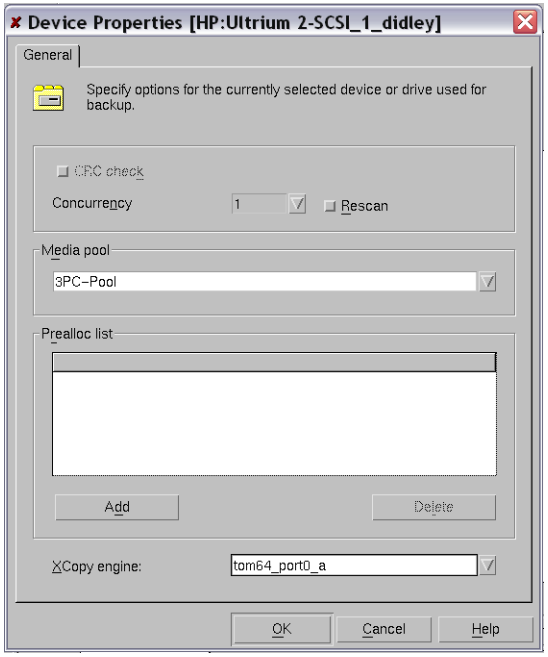


Figure 15: Setting device properties

- After the properties have been set for the selected tape drive, click **Next** in the destination drive window.
- Click **Next** in the backup options window.
- If desired, set a schedule in the schedule window, then click **Next**.
- Review your backup specification, then click **Next**.

- Save the backup specification by clicking the **Save as** icon in the **Perform finishing steps** window (see Figure 16).
- Type the name and select the group where you want to save your new backup specification, then click **OK**.

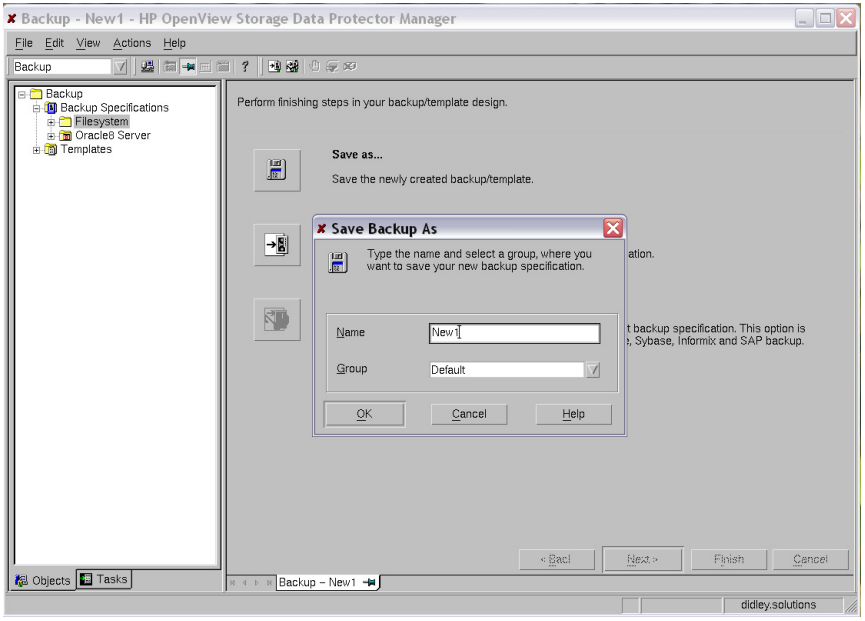


Figure 16: Saving the backup specification

The backup specification is now successfully created and saved.

Configuring Direct Backup on an ESL tape library with Interface Manager

To begin configuration of Direct Backup:

1. Start the HP StorageWorks Command View ESL web-based GUI for the Interface Manager of the ESL tape library by entering:

   `hostname:4095/cvesl.html`

   where hostname is either the host name or IP address of the Command View ESL management station.

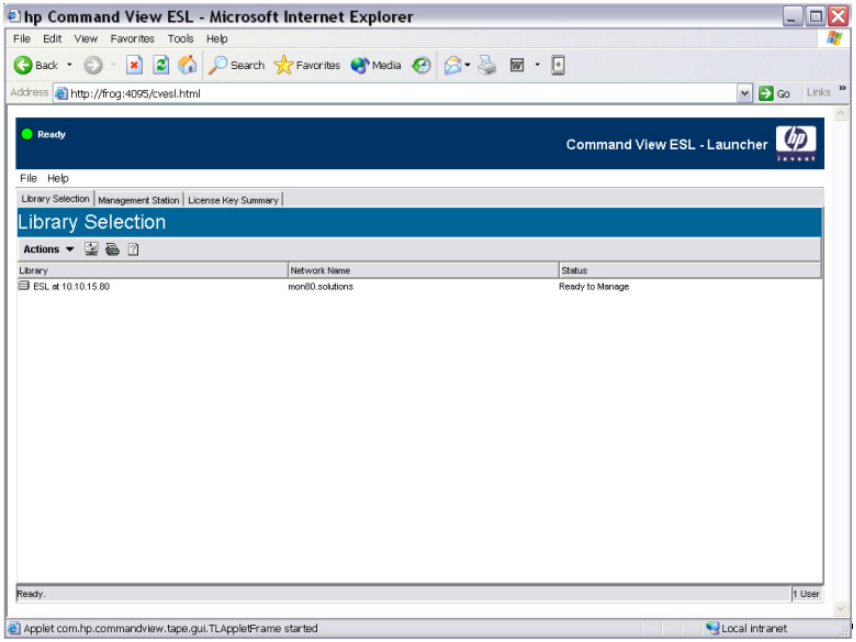


Figure 17: Selecting a library

2. Double-click the ESL tape library to display the library management window.

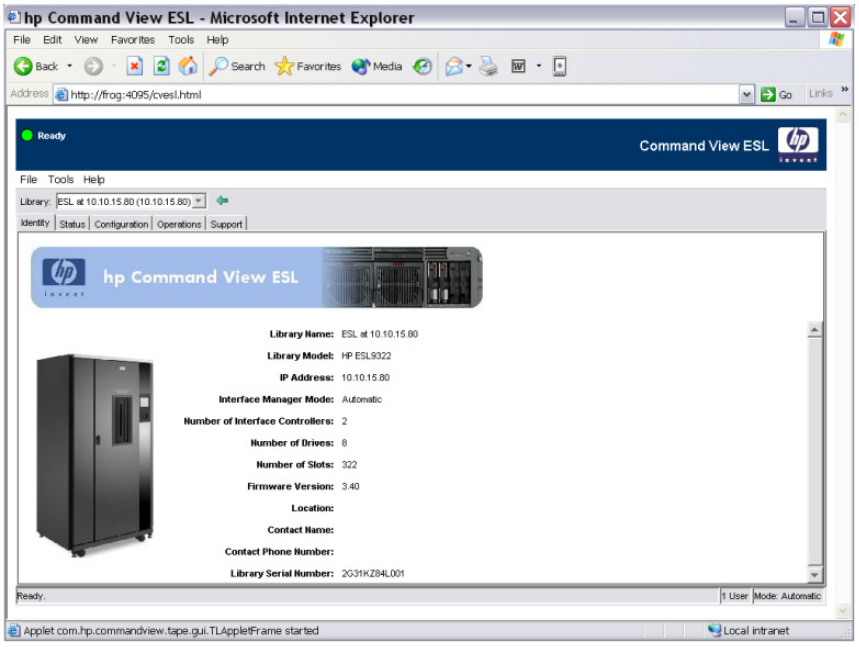


Figure 18: Library management window

3. Prepare for Direct Backup configuration by clicking the **Configuration** tab near the top of the Command View ESL window and then selecting **Direct Backup** in the left navigation window.

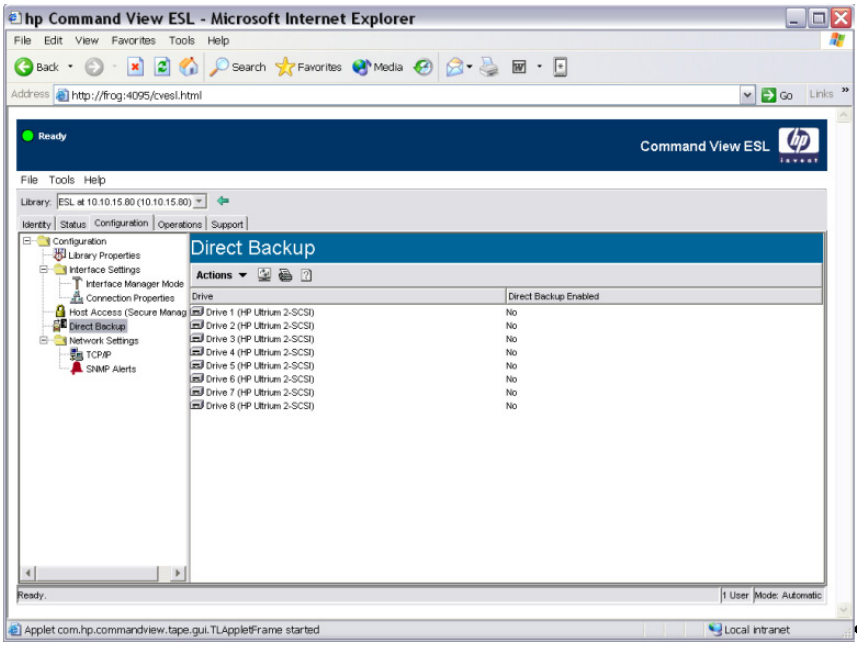


Figure 19: Configuration tab

4. Start the Direct Backup management window by choosing **Actions > Edit Direct Backup...**.

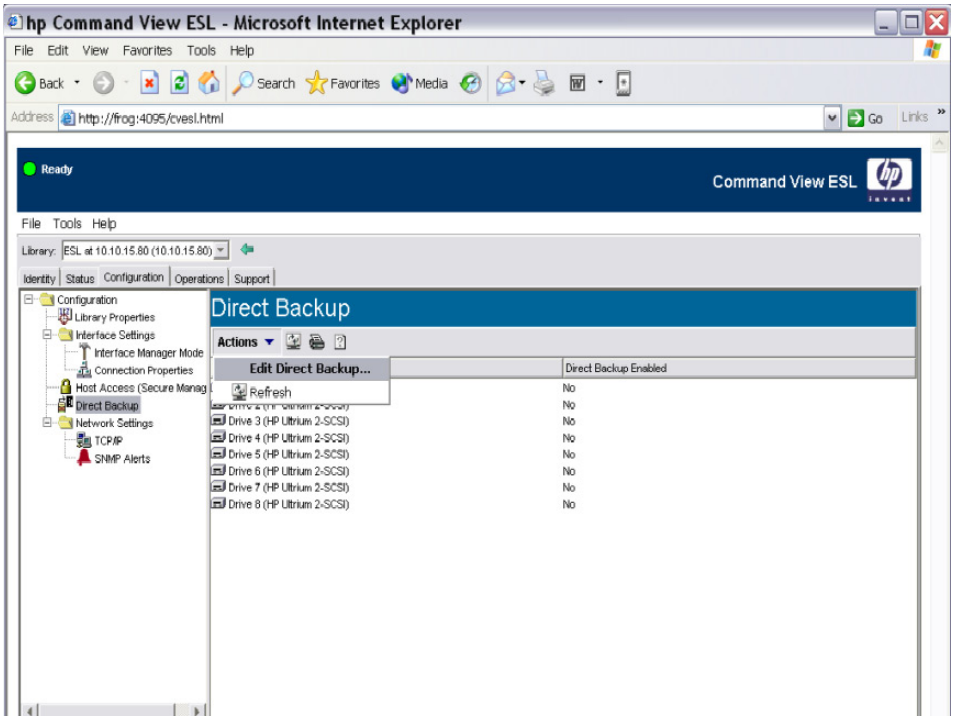


Figure 20: Direct Backup management window

5. Select the check box for each drive to be enabled for direct backup.

Note: A Direct Backup license key is required for each drive that is enabled. See the *HP StorageWorks Interface Manager and Command View ESL User Guide* for instructions on adding a license key.

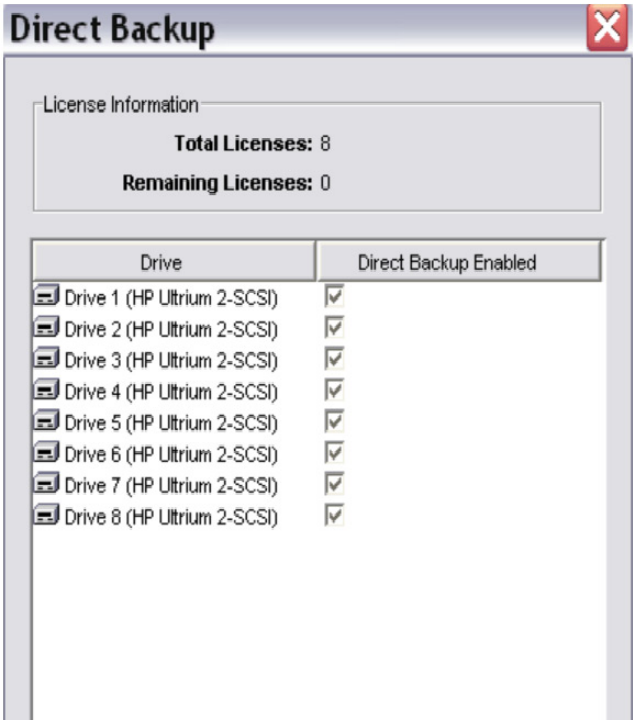


Figure 21: Enabling Direct Backup

6. Click **OK** to activate the changes. This initiates a reboot of the Fibre Channel Interface Controller(s) embedded in the ESL library.

Note: Make sure there are no active jobs in the tape library at this time. This action causes active jobs to fail.

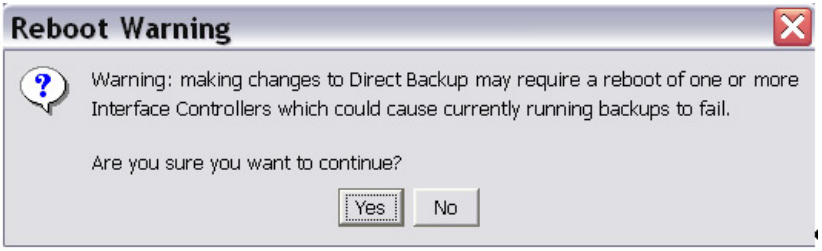


Figure 22: Reboot warning

7. To proceed, click **Yes** and wait for the Interface Controllers (s) to reboot. The ESL tape library is now ready for Direct Backup.

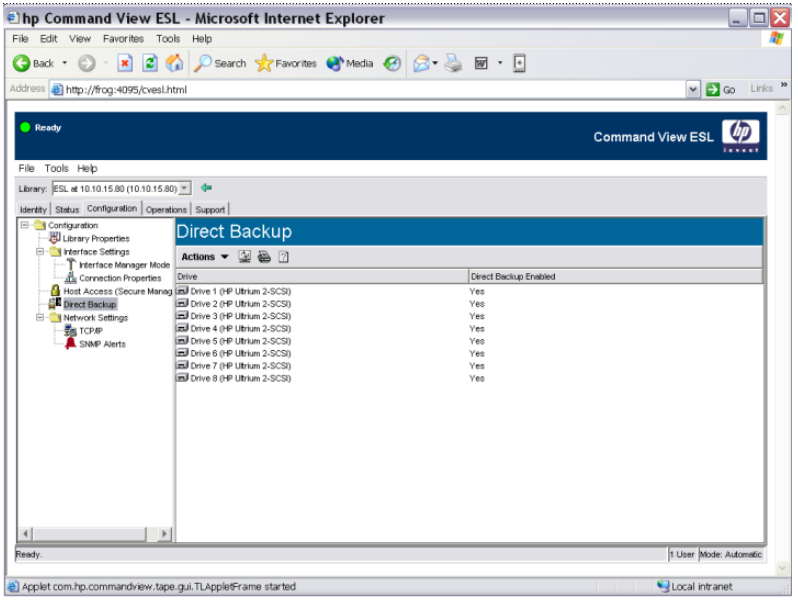


Figure 23: Direct Backup enabled

Setting up the Fibre Channel Interface Controller

Note: This section is for use with legacy products, such as the NSR M2402.

Preparing the hardware

The BCVs for the data volumes should already be presented to the Fibre Channel Interface Controller from the disk array. A disk array command device should already be presented to the Fibre Channel Interface Controller.

Note: See "Setting up BCV on the HP StorageWorks XP128/XP1024 disk array" on page 22 for instructions on presenting BCVs and a command device to the Fibre Channel Interface Controller.

Setting up the Fibre Channel Interface Controller for Direct Backup

1. Start the web-based GUI for the Fibre Channel Interface Controller by entering the IP address or host name in the address box of your web browser (see Figure 24).

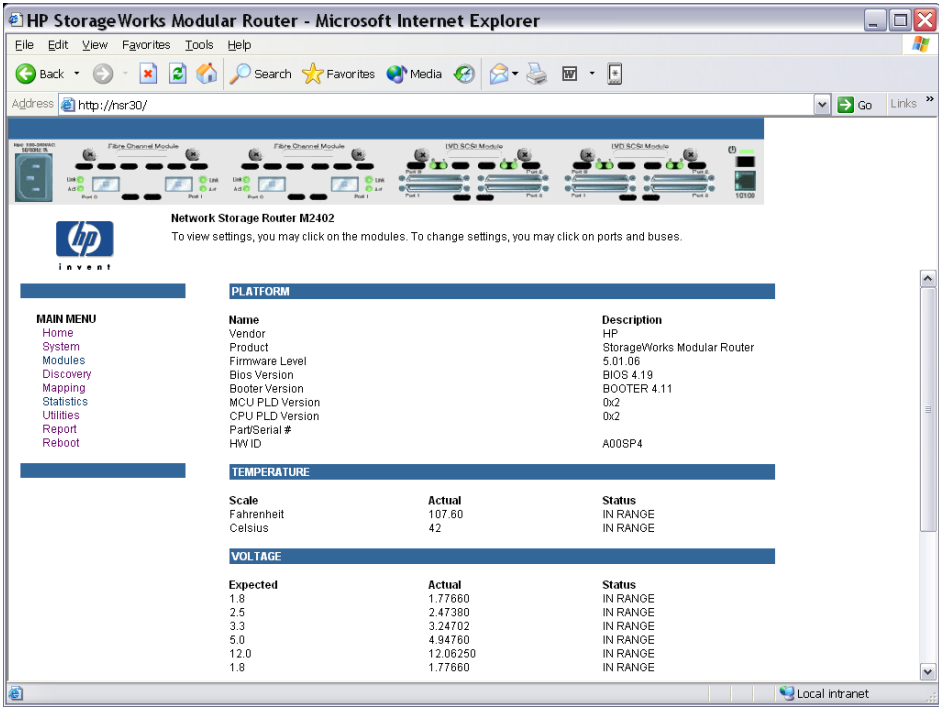


Figure 24: Starting the FC Interface Controller GUI

2. Select **System** from the **Main Menu**, then select **Active Fabric** from the **System Menu**.

3. In the **Active Fabric** window, set the **Server Free Backup Mode** to **Enabled**. Make sure that the **Number of Controller LUNs** is at least **1.** Click **Submit** to save the changes (see Figure 25).

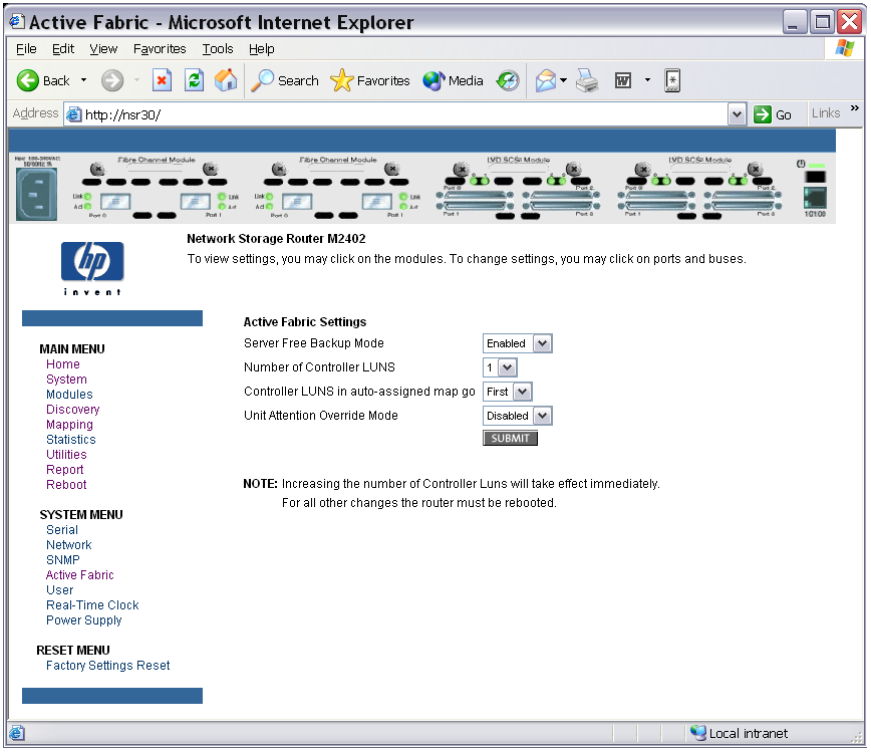


Figure 25: Enabling server free backup

4. Click **Reboot** from the **Main Menu** to make the changes active.

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